

Tongyao Zhang

Department of Psychological and Brain Sciences
Indiana University, 1101 E 10th St, Bloomington, IN, 47405
zhang.tongyao.2@gmail.com, zhangton@iu.edu
<https://orcid.org/0000-0001-6587-345X>, [Personal Website](#)

Education

- 2021 – 2026 Ph.D. in Psychology, Indiana University, United States
Concentration: Developmental Psychology and Cognitive Science
Advisory committee: Dr. Emily R. Fyfe (chair), Dr. Karin H. James, Dr. Linda B. Smith, Dr. Robert L. Goldstone
- 2016 – 2020 B.Sc. in Psychology, Beijing Normal University, China
Concentration: Cognitive and Developmental training,
Advisors: Dr. Qingfen Hu, Dr. Roi Cohen-Kadosh, Dr. Xinlin Zhou

Research Positions

- July 2026 – present Postdoctoral Fellow, Indiana University, United States
[AI in Education Project](#) with [Terracotta](#), PI: Dr. Benjamin Motz

Honors and Awards

- 2025 Foundry10 Travel Award for the Mathematical Cognition and Learning Society, \$600
- 2024 Kempf Fellowship in Psychology, \$6,000
- 2022 – 2024 NIH T32 Training Grant in Integrative Developmental Process, Director: Dr. Linda B. Smith, \$25,000/year
- 2019 Second-Class Outstanding Undergraduate Scholarship, Beijing Normal University
- 2019 Fung Scholarship, University of Oxford (funded by Victor and William Fung Foundation), PI: Dr. Roi Cohen-Kadosh, £3,500
- 2018 Third-Class Outstanding Undergraduate Scholarship, Beijing Normal University

Publications

- Borriello, G. A., **Zhang**, T., Wang, W., Peng, P., & Fyfe, E. R. A meta-analytic review of the associations between patterning and academic achievement. (In press in *Psychological Bulletin*)

- Zhang**, T., Borriello, G. A., James, K. H., & Fyfe, E. R. (2025). The role of patterning skill in cognitive development and learning: A critical review. *Developmental Review*, 76, 101202. <https://doi.org/10.1016/j.dr.2025.101202>
- Gök*, S., **Zhang***, T., Goldstone, R. L., & Fyfe, E. R. (2025). Multimedia effects in initial instruction and feedback on problem solving. *Journal of Educational Psychology*, 117(7), 1077–1094. <https://doi.org/10.1037/edu0000943> (*shared first authorship)
- Motz, B., Diekman, A., Goldstone, R., Green, D., Fyfe, E., Bernardini, S., ...**Zhang**, T., & Murphy, M. (2025). A field-initiated vision of research infrastructure for STEM education. *International Journal of STEM Education*, 12(1), 1–13. <https://doi.org/10.1186/s40594-025-00581-z>
- Zhang**, T., & Fyfe, E. R. (2024). High variability in learning materials benefits children’s pattern practice. *Journal of Experimental Child Psychology*, 239, 105829. <https://doi.org/10.1016/j.jecp.2023.105829>

Manuscripts

- Zhang**, T., & Fyfe, E. R. The effect of combined patterning and numeracy instruction on children’s mathematics learning. (Under revision)
- Zhang**, T., & Fyfe, E. R. Promoting abstract thinking with symbolic labels in pattern practice. (Under review)
- Zhang**, T., & Fyfe, E. R. Tuned to Focus on Structure: Connection between Patterning and Reasoning. (In preparation)

Talks and Conference Presentations

- Zhang**, T., Fyfe, E. R. (expected 2026, November). Patterning Practice Tunes Learners to Focus on Structures. Poster to be presented at the Psychonomic Society 67th Annual Meeting, San Diego, CA, United States.
- Zhang**, T., Gök, S., Gold, G., Carvalho, P. F., Fyfe, E. R. (2026, July). Effectiveness and Efficiency of Multimedia Worked Examples vs. Practice with Feedback on Learning Problem Solving. Poster virtually presented at the Cognitive Science Society, Rio de Janeiro, Brazil.
- Zhang**, T., Fyfe, E. R. (2026, April). “It’s always the same pattern”: Promoting abstract thinking with symbolic labels in pattern practice. Poster presented at the Biennial Meeting of the Cognitive Development Society (CDS), Montréal, Canada.
- Zhang**, T. (2026, February). From Patterns to Numbers: The Interplay of Cognitive Skills in Early Learning. Invited talk at the Brain and Cognitive Development Lab, University of Illinois Urbana-Champaign, United States.

- Zhang, T., Fyfe, E. R. (2025, June).** Tuned to focus on structure: Connection between patterning and reasoning. Poster presented at the Mathematical Cognition and Learning Society (MCLS), Hong Kong S.A.R., China.
- Zhang, T., Fyfe, E. R. (2025, May).** Counting with patterns: The effect of including patterns in numeracy instructions. Poster presented at the Society for Research in Child Development (SRCD), Minneapolis, MN, United States.
- Zhang, T., & Fyfe, E. R. (2024, June).** Malleability of various patterning skills in 5- and 6-year-old children. In Nicholas A. Vest & Chen Xueliang (Chairs), Pattern learning: Empirical research about interventions, parental beliefs, and links to mathematical competence in children [Symposium]. Mathematical Cognition and Learning Society (MCLS), Washington, DC, United States.
- Gök, S., **Zhang, T.**, Goldstone, R., Fyfe, E. R. (2024, April). Multimedia materials are more effective in feedback than in main instruction. Poster presented at the American Educational Research Association (AERA), Philadelphia, PA, United States.
- Zhang, T.**, Gök, S., Fyfe, E. R., Goldstone, R. (2024, April). The impact of instructional visualizations on students' drawings during mathematical problem solving. Poster presented at the American Educational Research Association (AERA), Philadelphia, PA, United States.
- Zhang, T. & Fyfe, E. R. (2024, March).** Not all pattern tasks are equal: Predicting children's numeracy skills from early patterning assessments. Poster presented at the Biennial Meeting of the Cognitive Development Society (CDS), Pasadena, CA, United States.
- Borriello, G. A., Peng, P., **Zhang, T.**, Fyfe, E. R. (2023, March). A meta-analysis examining relations between patterning, cognition, and math and reading achievement. Poster presented at the Society for Research in Child Development (SRCD) 2023 Biennial Meeting, Salt Lake City, UT, United States.
- Zhang, T. & Fyfe, E. R., (2023, June).** The benefits of mixing it up: Variable materials influence children's pattern practice. Talk presented at the Midwest Cognitive Science Conference, Grand Rapids, MI, United States.
- Zhang, T. & Fyfe, E. R., (2022, March).** Variability in Pattern Practice. Poster presented at the Biennial Meeting of the Cognitive Development Society (CDS), Madison, WI, United States.

Journal Reviewing

Journal of Experimental Child Psychology
 Child Development (co-review)

Teaching

P429 Lab in Developmental Psychology, Indiana University

In-person course with a combination of lectures, discussions, and workshops. Students generate their own research projects, conduct analysis, and report their results.

Fall 2025 (Instructor of Record), Fall 2024 – Spring 2025 (Associate Instructor)

P315 Developmental Psychology, Indiana University

Large-enrollment in-person lecture-style course. Introduces students to how and why behavior changes over time, the theories and methods used to study change, and relevant topics within development including perception, movement, language, and cognition.

Fall 2022 – Spring 2024 (Associate Instructor and Guest Lecturer)

P211 Methods of Experimental Psychology, Indiana University

Large-enrollment in-person lecture-style course. Introduces students to experimental methods in psychological sciences.

Multiple sessions during Fall 2021 – Fall 2023 (Graduate Teaching Assistant)

P442 Infant Development, Indiana University

In-person lecture-style course. Introduces students to the developmental changes during infancy.

Spring 2026 (Graduate Teaching Assistant)

Undergraduate Mentoring

Fall 2026	Claire Nettles, Audrey Barriball
Summer 2026	Neharika Upadhyay
Fall 2025 – Spring 2026	Avery Refka, Ameer Abu-Salih
Fall 2025	Willow Burton
Fall 2024	Vigna Inturi
Spring 2024 – Spring 2025	Nicole Namack
Fall 2023 – Spring 2025	Ben Hanson
Fall 2023 – Summer 2024	Allyson Utz, Jillian Pullen
Spring 2022 – Summer 2023	Anna Settle
Fall 2022 – Spring 2023	Rutvi Shah
Spring 2022 – Summer 2022	Wenwen Du

Memberships

American Educational Research Association (AERA)
Cognitive Development Society (CDS)
Cognitive Science Society (CogSci)
Mathematical Cognition and Learning Society (MCLS)
Society for Research in Child Development (SRCD)

Skills

Programming: R, JsPsych, PsychoPy, MATLAB, C#
Language: Mandarin (Native), English (Fluent), Japanese (Intermediate) – JLPT N2